



ESD- and TRA-System

ESD Testers



I Standards, ES-Sources

II ESD3000 up to 32 kV

III Modules and Networks

IV Accessories



General Information Electrostatic Source, Standards

Source of Interference

What causes electrostatic discharges?

A person becomes electrostatically charged by walking over an insulating floor surface. The capacity of the body can be charged to several kilovolts. This capacity is discharged when contact is made with an electronic unit or system. The discharge is visible with a spark in many cases and can be felt by the person concerned, who gets a "shock". The discharges are harmless to humans, but not to sensitive, modern electronic equipment. The resulting current causes interference in the units or make entire systems "crash". It has been known to the electrical industry for over 30 years that electrostatic discharges as encountered every day can have a disastrous effect on electronic equipment. The cost of damage caused by ESD is difficult to assess, but amounts to billions of dollars worldwide.

The areas most affected are:

- manufacturing of integrated circuits
- the chemical industry e.g. with explosions, fires related to and from sparks.
- malfunctioning of process controllers and electronic equipment.

EMC PARTNER offers a new hand-held ESD test system for contact discharge (CD) up to 30 kV and air discharge (AD) up to 32 kV - the ESD3000.



Standards Dealing with ESD Tests

IEC

IEC 61000-4-2: (A2:2000) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.

IEC 61340-3-1: Electrostatics - Part 3-1: Electrostatic discharge simulation - Human body model (HBM) - Component testing.

IEC 61340-3-2: Electrostatics - Part 3-2: Electrostatic discharge simulation - Machine model (MM) - Component testing.

ISO

ISO 10605 (2001-12-15): Road vehicle - Test methods for electrical disturbance from electrostatic discharges.

MIL

MIL-STD-883E (22. March 1999): ESD classification testing of devices.

EN

EN 61000-4-2 (A2:2000): Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.

EUROCAE ED-14D / RTCA DO-160D

Environmental Conditions and Test Procedure for Airborne Equipment. Section 25: Electrostatic Discharge.

ITU-T K.20

Refers to IEC 61000-4-2 (A2:2000): Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.

ANSI C63.16

American National Standard for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment.

GR-78-CORE

Generic Requirements for the Physical Design and Manufacture of Telecommunications products and Equipment.

ESD3000 System Standard Accessory

About the System

The test object itself determines which test method must be used: contact discharge when metallic parts are present, air discharge where plastic housings with slots exist or indirect discharge at insulation enclosure.



The ESD3000 is a hand-held discharge tester with different accessories opening a broad range of applications for contact discharge, air discharge and indirect discharge. With the easily interchangeable discharge modules (DM) the ESD3000 can be quickly adapted to the specified circuits of the standards listed on the opposite page. The modules contain a high voltage circuit. Therefore the ESD3000 can be used with all DM, RM and DN also with different voltage levels. The rechargeable battery pack has enough capacity to operate at the highest voltage level and 1 Hz repetition during one full working day (8 hours).

For long term ESD evaluation the ESD3000 can be set on top of a support.

Standard accessories to ESD3000:

- One set of rechargeable batteries NiMH standard UM-3/AA size
- Power adapter
- Earth cable
- User manual with verification protocol, conformity declaration and software package
- Serial link cable to update the software via EMC Partner's website

Outstanding Features

- All relevant parameters in one display
- Easy parameter changing during operation with one hand



Uch: +8.00kV
L4
Discharge : Contact
Trigger : Man

Uch: +32.0kV
Discharge : Air
Trigger : Man

- Voltage generation up to 32 kV positive and negative
- Commercially available standard or rechargeable batteries can be used
- Low weight (only 870 gr.) and ergonomic form for great accessibility to EUT.
- The additional modules and networks can be easily interchanged
- Batteries can be recharged inside the ESD3000 with the power adapter.

ESD3000 Control Circuit

- Discharge mode: contact or air discharge
- Polarity: positive, negative, alternate
- Number of discharges preselectable
- Discharge detection indicates every puls or counts real discharge only
- Ramps: voltage
- Reporting: test sequence, number of discharges, charging voltage, polarity
- Repetition: 50 ms up to 30 s

Remote Control

A PC with an optical link and the TEMA software (accessories) allows

- Control from PC
- Automated protocol generation (ESD)

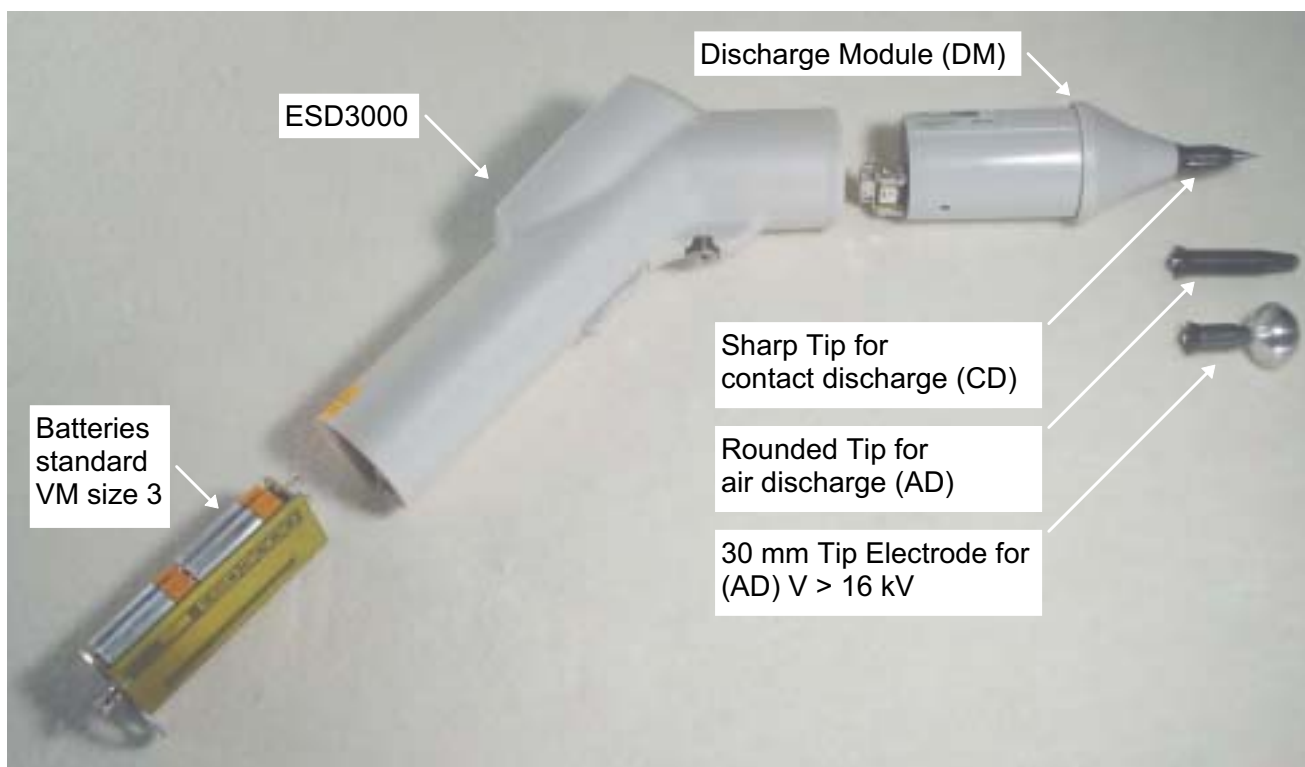
The TRA2000 with serial cable allows

- Power from TRA2000
- Control from TRA2000
- Automated protocol generation (ESD, EFT, surge, dips, interruption and magnetic field)

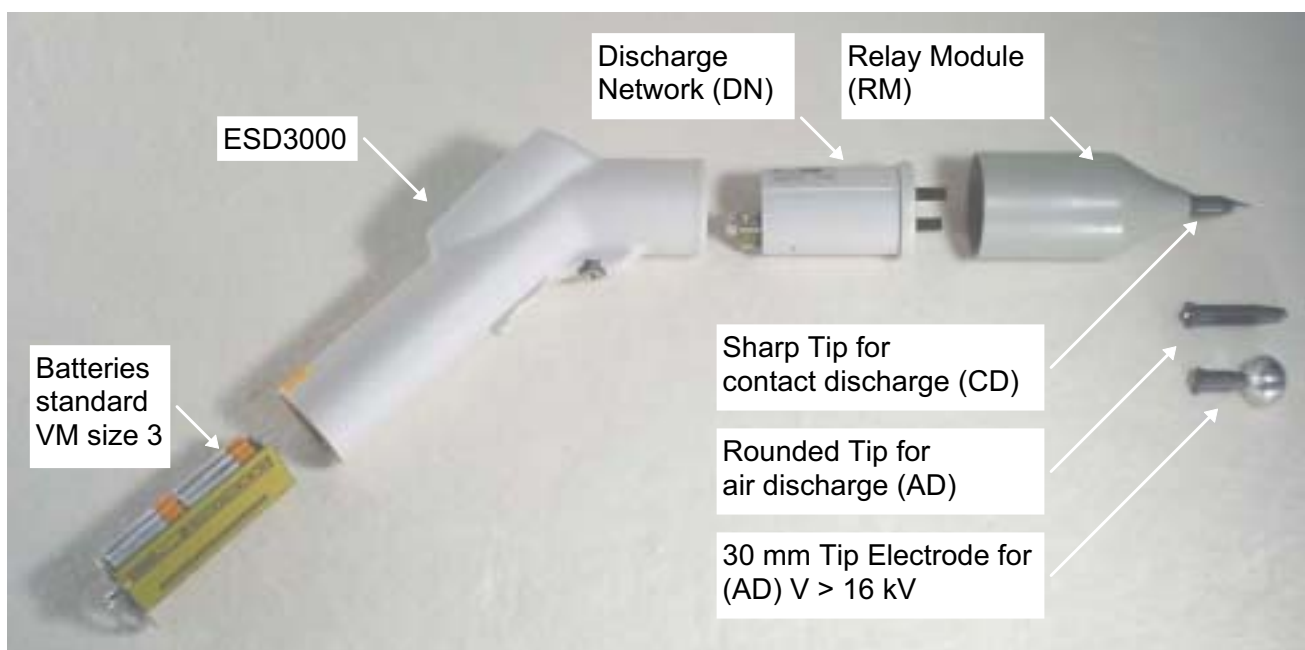
ESD3000 System Overview

Discharge Modules, Relay Modules, Discharge Networks

ESD3000 System: Contact Discharge up to max. 10 kV with Discharge Modules (DM)



ESD3000 System: Contact Discharge up to max. 30 kV with Relay Modules (RM) and Discharge Networks (DN)



Discharge Module in accordance with IEC 61000-4-2: Contact Discharge up to 10 kV, Air Discharge up to 16 kV

ESD3000DM1 – complying with IEC 61000-4-2



Technical data of the ESD3000DM1

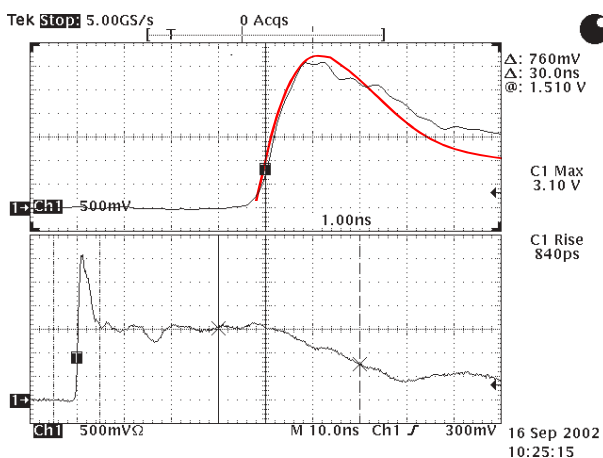
- Discharges: up to 10 kV (CD), 16 kV (AD)
- Network: 150 pf, 330 Ohm
- Holding time: > 5 s
- Current rise time : 0.7 to 1 ns
- Peak current: 3.75 A/kV
- Repetition: single or up to 20 Hz
- Electrodes: changable for AD and CD
- d.c. mode for searching weak points

Calibration

I_{peak} , rise time, I_{peak} at 30 and 60 ns on 2 Ohm shunt, d.c. voltage on 20 GOhm

Smoothed waveform

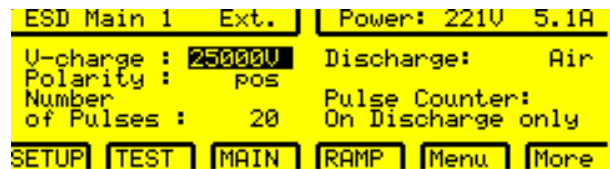
The ESD3000DM1 complies with the future waveform definition in accordance with IEC 61000-4-2 or ANSIC63.16



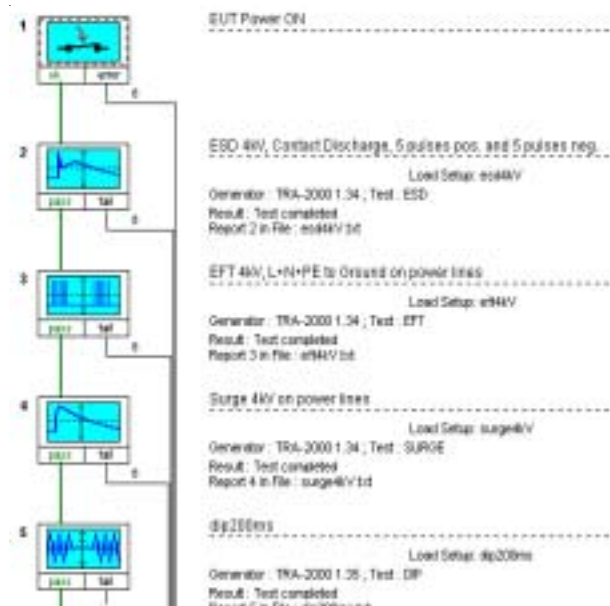
Red: mathematical nominal discharge current; black: current measured with DM1.

The ESD3000 in combination with the TRA2000 offers the following advantages:

- Same control as for the immunity tests EFT, surge, dips. Therefore automated tests programmable with other immunity tests.
- Automated polarity change
- Signalisation of real discharge, only the effective discharges are counted
- Recording of the ESD tests
- Statistical measurements are possible because of the automated control and protocol
- Automated ramp function for voltage and polarity.



The ESD3000 can be controlled remotely via an optical link directly from a PC or from the TRA2000 with a serial interface connection (ESD-TRA-LINK). The ESD3000 can be programmed from the TRA2000 as EFT, surge or dips (see picture below). The test results of ESD3000 are shown together with EFT, etc. in one protocol.



Discharge Modules in accordance with ISO 10605E: Contact Discharge up to 10 kV, Air Discharge up to 32 kV

ESD3000DM2 – complying with ISO 10605E (inside vehicle, module tests)



Technical data of the ESD3000DM2

- Discharges: up to 10 kV (CD), 16 kV (AD)
- Network: 330 pf, 2000 Ohm
- Holding time: > 5 s
- Current rise time: 0.7 to 1 ns
- Peak current: 3.75 A/kV
- Repetition: single or up to 20 Hz
- Electrodes: changable for AD and CD
- RC time constant: 600 ± 130 ns
- d.c. mode for searching weak points

Calibration

I_{peak} , rise time of CD and AD, RC time constant, d.c. voltage on 20 GOhm

Test levels: Electronic module

Direct discharge:

± 4 kV, ± 6 kV, ± 7 kV, ± 8 kV

Air discharge:

± 4 kV, ± 8 kV, ± 14 kV, ± 15 kV

Classification of products:

Direct discharge:

± 4 kV, ± 6 kV, ± 8 kV

Air discharge:

± 4 kV, ± 15 kV, ± 25 kV

Vehicle test levels:

accessible from inside vehicle only:

± 4 kV, ± 8 kV, ± 14 kV, ± 15 kV

accessible from outside vehicle:

± 4 kV, ± 8 kV, ± 15 kV, ± 25 kV

ESD3000DM3 – complying with ISO 10605E (outside vehicle, sensitive classification)



Technical data of the ESD3000DM3+

- Air discharge: up to +32 kV
- Networks: 150 pf, 2000 Ohm
- Current rise time: < 5 ns at +15 kV
- Repetition: single or up to 20 Hz
- RC time constant: 300 ± 60 ns
- Voltage setting accuracy: $\pm 10\%$ for voltages greater than 5 kV and ± 500 V for voltage lower than 5 kV



Technical data of the ESD3000DM3-

- Air discharge: up to -32 kV
- Networks: 150 pf, 2000 Ohm
- Current rise time: < 5 ns at -15 kV
- Repetition: single or up to 20 Hz
- RC time constant: 300 ± 60 ns
- voltage setting accuracy: $\pm 10\%$ for voltages greater than 5 kV and ± 500 V for voltage lower than 5 kV

Calibration

Rise time of AD, RC time constant, d.c. voltage on 20 GOhm

For both DM the verification is equal.

Other Applications: DO-160D, MIL883, IEC 61340-3-1, IEC 61340-3-2

ESD3000DM4 – complying with MIL-STD-883E (22 March 1999) ESD classification testing of devices and GR-78-CORE (1 Sept 1997)



Technical data of the ESD3000DM4

- Contact discharge: 250 V up to 8000 V
- Impulse capacitor: 100 pf, 1500 Ohm
- Current rise time: < 10 ns
- Peak current: 0.67 A/kV
- Repetition: single or up to 20 Hz

Calibration

I_{peak} , rise time of CD, RC time constant on 50 and 500 Ohm, d.c. voltage on 20 GOhm

ESD3000DM5 – complying with RTCA/DO-160 Environmental Conditions and Test Procedure for Airborn Equip.



Technical data of the ESD3000DM5

- Air discharge: up to + 32 kV
- Network: 150 pf, 330 Ohm
- Current rise time: < 5 ns at +15 kV
- Repetition: single or up to 20 Hz
- RC time constant: 50 ns

Calibration

Rise time of AD, RC time constant, d.c. voltage on 20 GOhm

ESD3000DM6 – complying with IEC 61340 -3-1 (April 2002), Component Testing - Human body model (HBM)



Technical data of the ESD3000DM6

- Contact discharge: \pm 250 V up to 8 kV
- Network: 100 pf, 1500 Ohm
- Current rise time: 2 ns up to 10 ns
- Pulse decay time: 150 \pm 20 ns
- Peak current: 0.67 A/kV

Calibration

I_{peak} , rise time of CD, RC time constant on 500 Ohm, d.c. voltage on 20 GOhm

ESD3000DM7 – complying with IEC 61340-3-2 (April 2002), Machine Model (MM)



Technical data of the ESD3000DM7

- Contact discharge: up to \pm 3 kV
- Impulse capacitor: 200 pf, 0 Ohm
- I_{sc} at 800 V: 14 A \pm 15%
- Periode current: 63 ns up to 91 ns
- Damping I_1 to I_2 : 67 to 90%
- I_{peak} at 100 ns, 400 V, 500 Ohm load: 0.29 A \pm 15%
- I_{peak} at 500 Ohm: < 1.31 A
- Voltage range: 100 V, 200 V, 400 V, 800 V, continuously adjustable up to 3000 V

Overview of Modules (DM and RM) and Networks (DN) Ordering Information

Overview of the Discharge Modules (DM)

Modules	Standards	Cap. / Res.	Voltage range (CD) Contact Discharge	Voltage range (AD) Air Discharge
DM1	IEC 61000-4-2	150 pF / 330 Ohm	+/- 0.2 up to 10 kV	+/- 0.2 up to 16 kV
DM2	ISO TR10605	330 pF / 2000 Ohm	+/- 0.2 up to 10 kV	+/- 0.2 up to 16 kV
DM3	ISO TR10605	150 pF / 2000 Ohm	no CD	+ and -1 up to 32 kV
DM4	MIL-STD-883 GR78-CORE	100 pF / 1500 Ohm	+/- 0.2 up to 10 kV	+/- 0.2 up to 16 kV
DM5	RTCA/DO-160	150 pF / 330 Ohm	no CD	+ and -1 up to 32 kV
DM6	IEC 61340-3-1	100 pF / 1500 Ohm	+/- 0.2 up to 8 kV	no AD
DM7	IEC 61340-3-2	200 pF / 500 Ohm	+/- 0.08 up to 2.5 kV	no AD
DM10	IEC 61000-4-2 ANSI C63.16	rise time 0.7-1 ns rise time < 400 ps	+/- 0.2 up to 10 kV	+/- 0.2 up to 16 kV
DM16A	?	100 up to 500pF / 0 up to 2000 Ohm	no CD	+ and - 0.5 up to 16 kV
DM16C	?	100 up to 500pF / 0 up to 2000 Ohm	+/- 0.2 up to 10 kV	+/- 0.2 up to 16 kV
DM32A	?	100 up to 500pF / 0 up to 2000 Ohm	no CD	+ and - 1 up to 32 kV

Overview of the Relay Modules (RM) and Discharge Networks (DN)

Modules	Rise time first current peak	Cap. / Res.	Voltage range CD	Voltage range AD
RM32	0.7 up to 1 ns	no specific components	+/- 1 up to 30 kV	+/- 1 up to 32 kV
RM32F	< 400 ps	no specific components	+/- 1 up to 30 kV	+/- 1 up to 32 kV

Networks	Standard	Cap. / Res.	Voltage range CD	Voltage range AD
DN1	IEC 61000-4-2 RTCA/DO-160	150 pF / 330 Ohm	+/- 1 up to 30 kV	+/- 1 up to 32 kV
DN2	ISO TR10605	330 pF / 2000 Ohm	+/- 1 up to 30 kV	+/- 1 up to 32 kV
DN3	ISO TR10605	150 pF / 2000 Ohm	+/- 1 up to 30 kV	+/- 1 up to 32 kV
DN4	MIL-STD-1512	500 pF / 5000 Ohm	+/- 1 up to 30 kV	+/- 1 up to 32 kV
DN32	?	100 up to 1000 pF / 0 up to 10000 Ohm	+/- 1 up to 30 kV	+/- 1 up to 32 kV

8 | In case of orders and requests please provide the name of the modules and the networks that is mentioned in the first column.

Optional Accessories

ESD-TARGET1

2 Ohm target with N connector and N-BNC adapter, upper limit approximatly 2 GHz.

Application: ESD verification in accordance with IEC/EN 61000-4-2.



ESD-TARGET2

2 Ohm target with SMA connector, upper limit > 4 GHz, 20 dB attenuator and 1 m coaxial cable. Calibration: target-attenuator-cable chain. Application: ESD calibration and comparison.



ESD-VERI-V

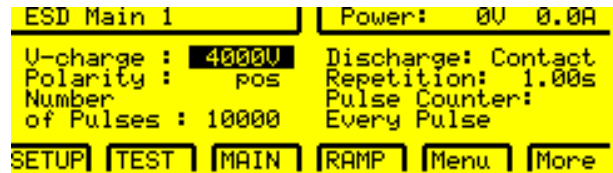
20 G Ohm divider for high voltage measurement on the ESD3000 up to 25 kV.

Ratio is determined by the 1 M Ohm input of the oscilloscope. Ratio approx. 20'000.



TEMA Software

Comfortable control of TRA2000 and MIG2000 system including ESD3000



ESD-OPTOLINK

Optical link to control ESD3000 from PC

- length: 10 m
- must be ordered with TEMA software

VCP50 - Vertical Coupling Plate

- Mechanical dimension: 0.5 x 0.5 m
- Application: indirect ESD discharge with contact tip
- Accessory: 2 m cable with 2 x 470 kOhm resistors



ESD-STAND3

- Height adjustable from 0.4 m up to 1.75 m
- Application: long term tests in contact and air discharge mode



ESD3000 and ESD2000 with TRA2000 Important Features not Specified in the Standards

ESD-TRA-CABLE



Serial link (RS232) to control ESD3000 from TRA2000
- length: 3 m

TRA2000 with ESD3000



The combination of the TRA2000 and the ESD3000 via the ESD-TRA-LINK offers the following possibilities:

- unlimited storage places
- immediate protocol printing in the same protocol as surge, EFT, etc.

TRA2000 with ESD2000



The low cost solution for customers that own a TRA2000. The ESD3000 complies fully with IEC/EN 61000-4-2 up to 10 kV contact and 15 kV air discharge.

Further Features of the ESD3000

- The maximum contact discharge voltage specified in standards is 25 kV. The ability of ESD3000 to exceed the 25 kV can be used as a means of evaluating immunity limits for special environments.
- In certain environment the real ESD discharge current rise time is lower 0.7 to 1 ns as specified in IEC 61000-4-2. The ESD3000 with the discharge module DM10 allows both a rise time of 0.7 ns and fast rise times (< 0.4 ns).
- Most of the ESD3000 competing products have a manual operated polarity change. The ESD3000 polarity change can be programmed up to 30 kV.
- Because of the ergonomic form of the ESD3000 every test point of an EUT can be contacted as in the real word by the finger.
- The ESD3000 does not generate multiple discharges (air and contact) in single mode. The high voltage generation source is de-coupled after the first discharge.
- The same impulse forming network is used for air and contact discharge. For air discharge the high voltage relay is closed. This generates an air discharge current waveform equal to the contact discharge current waveform at least at low voltages up to about 4 kV.
- The ESD3000 system is able to fulfil all known ESD standards and human body models as well as most machine models.
- Each discharge module and each discharge network together with the relay module is calibrated in accordance with the calibration process specified in existing or proposed standards.

For further information please do not hesitate to contact EMC PARTNER's representative in your region. You will also find a lot of useful information on www.emc-partner.com.

EMC PARTNER's Product Range

Immunity Tests



The TRA2000 performs all of the following transient tests on electronic equipment that are required for the CE-mark up to full levels: **ESD, EFT, surge, dips, a.c. magnetic field, surge magnetic field and common mode tests**. A large range of accessories for different applications is available: MF antennas, three phase couplers, verification sets, coupling kits, etc. The TRA2000 complies with IEC 61000-4-2, -4, -5, -8, -9, -11, -12p, -16, -29p.



The Modular Impulse Generator (MIG) performs **damped oscillatory tests**: 100 kHz, 1 MHz, voltage and magnetic field tests. The MIG complies with IEC 61000-4-8, -9, -10, -12 as well as with IEC 60255-4, -5, -22.



The HAR1000 with the Immunity software performs the following tests: **harmonics, voltage variation and ripple on d.c.** The HARMONICS-1000 complies with IEC 61000-4-13, -14, -17, -29p.

Lightning Tests

EMC PARTNER offers a wide range of testers in accordance with FCC 68 part D, ITU K.44, ETS 300 046, Bellcore and RTCA DO-160D, etc. for telecom, aircraft and military electronic equipment testing.



Component Tests



EMC PARTNER offers a wide range of modular impulse generators (MIG) for transient component testing on: varistors, arresters, surge protective devices (SPD), capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc.

EMC PARTNER has the largest range of impulse generators in the range up to 100 kV and 100 kA. Below is an example for an insulation tester up to 24 kV.



Emission Measurements



One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark. The HAR1000 includes an amplifier for a clean power source, a line impedance network, the measurement systems Harmonics and Flicker. Accessories: three phase extension, "Immunity" and "ANASIM" software. Complies with IEC 61000-3-2 and -3.

We look forward to starting a dialogue with you

For more detailed information please contact our representative in your area or EMC PARTNER in Switzerland. For information on further products please visit also our website.

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Europe: Austria, Belgium, France, Germany, Great Britain, Hungary, Ireland, Italy, Netherlands, Scandinavia, Spain, ...

You will find contact information for all representatives at EMC PARTNER's website www.emc-partner.com.

Your local representative:

EMC PARTNER offers the largest range of impulse test equipment up to 100 kA and 100 kV in the areas of:

Immunity Tests

Lightning Tests

Component Tests

Emission Measurements